

## General

### Title

Acute myocardial infarction (AMI): hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following AMI hospitalization.

### Source(s)

Specifications manual for national hospital inpatient quality measures, version 3.1a. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; 2010 Apr 1. various p.

## Measure Domain

### Primary Measure Domain

#### Outcome

The validity of measures depends on how they are built. By examining the key building blocks of a measure, you can assess its validity for your purpose. For more information, visit the [Measure Validity](#) page.

### Secondary Measure Domain

Does not apply to this measure

## Brief Abstract

### Description

This measure\* is a hospital-specific, risk-standardized, all-cause 30-day readmission (defined as readmission for any cause within 30 days from the date of discharge of the index admission) for patients discharged from the hospital with a principal discharge diagnosis of acute myocardial infarction (AMI).

\*This is a Centers for Medicare & Medicaid Services (CMS) only measure.

### Rationale

Centers for Medicare & Medicaid Services (CMS) developed the acute myocardial infarction (AMI) 30-day readmission measure to complement the existing AMI process-of-care and mortality measures. Risk-standardized readmission rates (RSRRs) can provide important additional information about quality of

care that is currently not captured by the process and mortality measures and is currently unavailable to hospitals. Variation in readmission, after adjusting for case mix, may reflect differences in hospitals' general environments (such as coordination of care, patient safety policies, and staffing) or variation in care processes not measured in the current core measure set. Outcome measures can focus attention on a broader set of healthcare activities that affect patients' well-being. Moreover, improving outcomes is the ultimate goal of quality improvement, and thus the inclusion of outcomes measures assists in attaining improvement goals.

Readmission of patients who were recently discharged after hospitalization with AMI represents an important, expensive, adverse outcome. The risk of readmission can be modified by the quality and type of care provided to these patients. Improving readmission rates is the joint responsibility of hospitals and clinicians. Measuring readmission will create incentives to invest in interventions to improve hospital care, better assess the readiness of patients for discharge, and facilitate transitions to outpatient status. This measure is also responsive to the recent call by the Medicare Payment Advisory Commission (MedPAC) to develop readmission measures, with AMI highlighted as one of seven conditions that account for nearly 30% of potentially preventable readmissions in the 15-day window after initial hospital discharge (MedPAC, 2007).

## Primary Clinical Component

Acute myocardial infarction (AMI); 30-day all-cause readmission rate

## Denominator Description

This cohort includes admissions for Medicare fee-for-service beneficiaries aged greater than or equal to 65 years with a principal discharge diagnosis of acute myocardial infarction (AMI) (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] codes 410.xx except for 410.x2) and with a complete claims history for 12 months prior to admission (see the related "Denominator Inclusions/Exclusions" field)

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, we are using this field to define our statistically-adjusted outcome measure.

Hierarchical logistic regression modeling is used to calculate a hospital-specific risk-standardized readmission rate (RSRR). The RSRR is calculated as the ratio of the number of "predicted" to the number of "expected" readmissions, multiplied by the national unadjusted readmission rate. For each hospital, the "numerator" of the ratio is the number of readmissions within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the "denominator" is the number of readmissions expected on the basis of the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case-mix to an average hospital's performance with the same case mix. Thus a lower ratio indicates lower-than-expected readmission or better quality and a higher ratio indicates higher-than-expected readmission or worse quality.

The predicted hospital outcome (the numerator) is calculated by regressing the risk factors and the hospital-specific intercept on the risk of readmission, multiplying the estimated regression coefficients by the patient characteristics in the hospital, transforming, and then summing over all patients attributed to the hospital to get a value. The expected number of readmissions (the denominator) is obtained by regressing the risk factors and a common intercept on the readmission outcome using all hospitals in our sample, multiplying the subsequent estimated regression coefficients by the patient characteristics observed in the hospital, transforming, and then summing over all patients in the hospital to get a value.

To assess hospital performance in any reporting period, the model coefficients are re-estimated using the years of data in that period. See the [2010 Measures Maintenance Technical Report: Acute Myocardial Infarction, Heart Failure, and Pneumonia 30-Day Risk-standardized Readmission Measures](#)  for more details.

## Numerator Description

The hospital-specific risk-standardized readmission rate (RSRR) is calculated as the ratio of predicted to expected readmissions, multiplied by the national unadjusted rate. The "numerator" of the ratio component is the predicted number of readmissions for each hospital within 30 days given the hospital's performance with its observed case mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of

adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we are using this field to define our statistically-adjusted outcome measure.

Hierarchical logistic regression modeling is used to calculate a hospital-specific RSRR. The RSRR is calculated as the ratio of the number of "predicted" to the number of "expected" readmissions, multiplied by the national unadjusted readmission rate. For each hospital, the "numerator" of the ratio is the number of readmissions within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the "denominator" is the number of readmissions expected on the basis of the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case-mix to an average hospital's performance with the same case mix. Thus a lower ratio indicates lower-than-expected readmission or better quality and a higher ratio indicates higher-than-expected readmission or worse quality.

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To assess hospital performance in any reporting period, the model coefficients are re-estimated using the years of data in that period. See the [2010 Measures Maintenance Technical Report: Acute Myocardial Infarction, Heart Failure, and Pneumonia 30-Day Risk-standardized Readmission Measures](#)  for more details.

## Evidence Supporting the Measure

### Evidence Supporting the Criterion of Quality

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

## Evidence Supporting Need for the Measure

### Need for the Measure

Variation in quality for the performance measured

### Evidence Supporting Need for the Measure

Specifications manual for national hospital inpatient quality measures, version 3.1a. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; 2010 Apr 1. various p.

## State of Use of the Measure

### State of Use

Current routine use

### Current Use

Collaborative inter-organizational quality improvement

External oversight/Medicare

Internal quality improvement

National reporting

# Application of Measure in its Current Use

## Care Setting

Hospitals

## Professionals Responsible for Health Care

Measure is not provider specific

## Lowest Level of Health Care Delivery Addressed

Single Health Care Delivery Organizations

## Target Population Age

Age greater than or equal to 65 years

## Target Population Gender

Either male or female

## Stratification by Vulnerable Populations

Unspecified

# Characteristics of the Primary Clinical Component

## Incidence/Prevalence

Acute myocardial infarction (AMI) is among the most common principal hospital discharge diagnoses among Medicare beneficiaries, and, in 2005, it was the fourth most expensive condition billed to Medicare (Andrews and Elixhauser, 2007). Readmission rates following discharge for AMI are high. For example, rates of all-cause readmission at 30 days have been found to range from 11.3% (Barbagelata et al., 2004) to 28.1% (Jonas et al., 1999).

## Evidence for Incidence/Prevalence

Andrews RM, Elixhauser A. The national hospital bill: growth trends and 2005 update on the most expensive conditions by payer. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Dec. (HCUP statistical brief; no. 42).

Barbagelata A, Califf RM, Sgarbossa EB, Knight D, Mark DB, Granger CB, Armstrong PW, Elizari M, Birnbaum Y, Grinfeld LR, Ohman EM, Wagner GS, GUSTO-1 Investigators. Prognostic value of predischARGE electrocardiographic measurement of infarct size after thrombolysis: insights from GUSTO I Economics and Quality of Life substudy. Am Heart J. 2004 Nov;148(5):795-802. [PubMed](#)

Jonas M, Grossman E, Boyko V, Behar S, Hod H, Reicher-Reiss H. Relation of early and one-year outcome after acute myocardial infarction to systemic arterial blood pressure on admission. *Am J Cardiol.* 1999 Jul 15;84(2):162-5. [PubMed](#)

## Association with Vulnerable Populations

Unspecified

## Burden of Illness

Acute myocardial infarction (AMI) is among the most common principal hospital discharge diagnoses among Medicare beneficiaries, and, in 2005, it was the fourth most expensive condition billed to Medicare (Andrews and Elixhauser, 2007). Readmission rates following discharge for AMI are high. For example, rates of all-cause readmission at 30 days have been found to range from 11.3% (Barbagelata et al., 2004) to 28.1% (Jonas et al., 1999).

Readmission rates are influenced by the quality of inpatient and outpatient care, the availability and use of effective disease management programs, and the bed capacity of the local health care system. Some of the variation in readmissions may be attributable to delivery system characteristics (Fisher et al., 1994). Also, interventions during and after a hospitalization can be effective in reducing readmission rates in geriatric populations generally (Benbassat and Taragin, 2000; Naylor et al., 1999; Coleman et al., 2006) and for AMI patients specifically (Carroll et al., 2007; Young et al., 2003; Bondestam et al., 1995; Ades et al., 1992). Moreover, such interventions can be cost saving (Coleman et al., 2006; Naylor et al., 1999; Ades et al., 1992). Tracking readmissions also emphasizes improvement in care transitions and care coordination. Although discharge planning is required by Medicare as a condition of participation for hospitals, transitional care focuses more broadly on "hand-offs" of care from one setting to another, and may have implications for quality and costs (Coleman, 2005).

The Medicare Payment Advisory Commission (MedPAC) has called for hospital-specific public reporting of readmission rates, identifying AMI as one of seven conditions that account for nearly 30% of potentially preventable readmissions in the 15-day window after initial hospital discharge (MedPAC, 2007). MedPAC finds that readmissions are common, costly, and often preventable. Based on 2005 Medicare data, MedPAC estimates that about 13.4% of Medicare AMI admissions were followed by a potentially preventable readmission within 15 days, accounting for nearly 21,000 admissions at a cost of \$136 million.

## Evidence for Burden of Illness

Ades PA, Huang D, Weaver SO. Cardiac rehabilitation participation predicts lower rehospitalization costs. *Am Heart J.* 1992 Apr;123(4 Pt 1):916-21. [PubMed](#)

Andrews RM, Elixhauser A. The national hospital bill: growth trends and 2005 update on the most expensive conditions by payer. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Dec. (HCUP statistical brief; no. 42).

Barbagelata A, Califf RM, Sgarbossa EB, Knight D, Mark DB, Granger CB, Armstrong PW, Elizari M, Birnbaum Y, Grinfeld LR, Ohman EM, Wagner GS, GUSTO-1 Investigators. Prognostic value of pre-discharge electrocardiographic measurement of infarct size after thrombolysis: insights from GUSTO I Economics and Quality of Life substudy. *Am Heart J.* 2004 Nov;148(5):795-802. [PubMed](#)

Benbassat J, Taragin M. Hospital readmissions as a measure of quality of health care: advantages and limitations. *Arch Intern Med.* 2000 Apr 24;160(8):1074-81. [PubMed](#)

Bondestam E, Breikss A, Hartford M. Effects of early rehabilitation on consumption of medical care during the first year after acute myocardial infarction in patients > or = 65 years of age. *Am J Cardiol*. 1995 Apr 15;75(12):767-71. [PubMed](#)

Carroll DL, Rankin SH, Cooper BA. The effects of a collaborative peer advisor/advanced practice nurse intervention: cardiac rehabilitation participation and rehospitalization in older adults after a cardiac event. *J Cardiovasc Nurs*. 2007 Jul-Aug;22(4):313-9. [PubMed](#)

Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med*. 2006 Sep 25;166(17):1822-8. [PubMed](#)

Coleman EA. Background paper on transitional care performance measurement. Appendix I. In: Institute of Medicine, performance measurement: accelerating improvement. Washington (DC): National Academy Press; 2005.

Fisher ES, Wennberg JE, Stukel TA, Sharp SM. Hospital readmission rates for cohorts of Medicare beneficiaries in Boston and New Haven. *N Engl J Med*. 1994 Oct 13;331(15):989-95. [PubMed](#)

Jonas M, Grossman E, Boyko V, Behar S, Hod H, Reicher-Reiss H. Relation of early and one-year outcome after acute myocardial infarction to systemic arterial blood pressure on admission. *Am J Cardiol*. 1999 Jul 15;84(2):162-5. [PubMed](#)

Medicare Payment Advisory Commission (MedPAC). Report to congress: promoting greater efficiency in Medicare. Medicare Payment Advisory Commission (MedPAC); 2007.

Naylor MD, Brooten D, Campbell R, Jacobsen BS, Mezey MD, Pauly MV, Schwartz JS. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA*. 1999 Feb 17;281(7):613-20. [PubMed](#)

Young W, Rewa G, Goodman SG, Jaglal SB, Cash L, Lefkowitz C, Coyte PC. Evaluation of a community-based inner-city disease management program for postmyocardial infarction patients: a randomized controlled trial. *CMAJ*. 2003 Oct 28;169(9):905-10. [PubMed](#)

## Utilization

See the "Burden of Illness" field.

## Costs

See the "Burden of Illness" field.

# Institute of Medicine (IOM) Healthcare Quality Report Categories

## IOM Care Need

Getting Better

## IOM Domain

# Data Collection for the Measure

## Case Finding

Users of care only

## Description of Case Finding

This cohort includes admissions for Medicare fee-for-service beneficiaries aged greater than or equal to 65 years with a principal discharge diagnosis of acute myocardial infarction (AMI) and with a complete claims history for 12 months prior to admission (see the "Denominator Inclusions/Exclusions" field for a list of all International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] codes for AMI)

## Denominator Sampling Frame

Patients associated with provider

## Denominator Inclusions/Exclusions

### Inclusions

This cohort includes admissions for Medicare fee-for-service beneficiaries aged greater than or equal to 65 years with a principal discharge diagnosis of acute myocardial infarction (AMI)\* and with a complete claims history for 12 months prior to admission

\*International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes that define the patient cohort:

- 410.00: AMI (anterolateral wall) – episode of care unspecified
- 410.01: AMI (anterolateral wall) – initial episode of care
- 410.10: AMI (other anterior wall) – episode of care unspecified
- 410.11: AMI (other anterior wall) – initial episode of care
- 410.20: AMI (inferolateral wall) – episode of care unspecified
- 410.21: AMI (inferolateral wall) – initial episode of care
- 410.30: AMI (inferoposterior wall) – episode of care unspecified
- 410.31: AMI (inferoposterior wall) – initial episode of care
- 410.40: AMI (other inferior wall) – episode of care unspecified
- 410.41: AMI (other inferior wall) – initial episode of care
- 410.50: AMI (other lateral wall) – episode of care unspecified
- 410.51: AMI (other lateral wall) – initial episode of care
- 410.60: AMI (true posterior wall) – episode of care unspecified
- 410.61: AMI (true posterior wall) – initial episode of care
- 410.70: AMI (subendocardial) – episode of care unspecified
- 410.71: AMI (subendocardial) – initial episode of care
- 410.80: AMI (other specified site) – episode of care unspecified
- 410.81: AMI (other specified site) – initial episode of care
- 410.90: AMI (unspecified site) – episode of care unspecified
- 410.91: AMI (unspecified site) – initial episode of care

Note: We do not include 410.x2 (AMI, subsequent episode of care).

### Exclusions

Admissions for patients with an in-hospital death are excluded because they are not eligible for readmission.

Admissions for patients without at least 30 days post-discharge enrollment in fee-for-service Medicare are excluded because the 30-day readmission outcome cannot be assessed in this group. Admissions for patients having a principal diagnosis of AMI during the index hospitalization and subsequently transferred to another acute care facility are excluded because we are focusing on discharges to non-acute care settings.

Admissions are excluded for patients who are discharged alive on the same day that they are admitted because these patients are unlikely to have had an AMI.

Admissions for patients who are discharged against medical advice (AMA) are excluded because providers did not have the opportunity to deliver full care and prepare the patient for discharge.

In addition, if a patient has one or more additional AMI admissions within 30 days of discharge from an index AMI admission, only one is counted as a readmission. No admissions within 30 days of discharge from an index admission are considered as additional index admissions. The next eligible admission after the 30-day time period following an index admission will be considered another index admission.

Admissions not counted as readmissions:

Some AMI patients have planned readmissions for revascularization procedures – for example, to perform percutaneous transluminal coronary angioplasty (PTCA) on a second vessel or a second location in the same vessel, or to perform coronary artery bypass graft (CABG) surgery after AMI and a period of recovery outside the hospital. Because admissions for PTCA and CABG may be staged or scheduled readmissions, we do not count as readmissions those admissions after discharge that include PTCA or CABG procedures unless the principal discharge diagnosis for the readmission is one of the following diagnoses (which are not consistent with a scheduled readmission): heart failure (HF), AMI, unstable angina, arrhythmia, and cardiac arrest (i.e., readmissions with these diagnoses and a PTCA or CABG procedure are counted as readmissions).

ICD-9-CM codes associated with PTCA and CABG revascularization procedures:

PTCA: 00.66, 36.01, 36.02, 36.05, 36.06, 36.07

CABG: 36.10–36.16

ICD-9-CM codes associated with HF, AMI, unstable angina, arrhythmia, and cardiac arrest:

HF: 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.xx

AMI: 410.xx, except 410.x2 (AMI, subsequent episode of care)

Unstable angina: 411.xx

Arrhythmia: 427.xx, except 427.5

Cardiac arrest: 427.5

## Relationship of Denominator to Numerator

All cases in the denominator are equally eligible to appear in the numerator

## Denominator (Index) Event

Clinical Condition

Institutionalization

## Denominator Time Window

Time window brackets index event

## Numerator Inclusions/Exclusions

Inclusions

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Note: This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of



adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we are using this field to define our statistically-adjusted outcome measure.

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The predicted hospital outcome (the numerator) is calculated by regressing the risk factors and the hospital-specific intercept on the risk of readmission, multiplying the estimated regression coefficients by the patient characteristics in the hospital, transforming, and then summing over all patients attributed to the hospital to get a value. The expected number of readmissions (the denominator) is obtained by regressing the risk factors and a common intercept on the readmission outcome using all hospitals in our sample, multiplying the subsequent estimated regression coefficients by the patient characteristics observed in the hospital, transforming, and then summing over all patients in the hospital to get a value.

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Exclusions

Unspecified

## Measure Results Under Control of Health Care Professionals, Organizations and/or Policymakers

The measure results are somewhat or substantially under the control of the health care professionals, organizations and/or policymakers to whom the measure applies.

## Numerator Time Window

Fixed time period

## Data Source

Administrative data

## Level of Determination of Quality

Not Individual Case

## Outcome Type

Adverse Outcome

## Pre-existing Instrument Used

None

## Computation of the Measure

## Scoring

Rate

# Interpretation of Score

Better quality is associated with a lower score

## Allowance for Patient Factors

Risk adjustment devised specifically for this measure/condition

## Description of Allowance for Patient Factors

Our approach to risk adjustment was tailored to and appropriate for a publicly reported outcome measure, as articulated in the American Heart Association (AHA) Scientific Statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes" (Krumholz et al., 2006).

The measure employs a hierarchical logistic regression model (a form of hierarchical generalized linear model [HGLM]) to create a hospital level 30-day risk-standardized readmission rate (RSRR). This approach to modeling appropriately accounts for the structure of the data (patients clustered within hospitals), the underlying risk due to patients' comorbidities, and sample size at a given hospital when estimating hospital readmission rates. In brief, the approach simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals (Normand et al., 2007). At the patient level, each model adjusts the log-odds of readmission within 30-days of admission for age, sex, selected clinical covariates and a hospital-specific intercept. The second level models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept, or hospital specific effect, represents the hospital contribution to the risk of readmission, after accounting for patient risk and sample size, and can be inferred as a measure of quality. The hospital-specific intercepts are given a distribution in order to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

Refer to the original measure documentation for the final set of risk-adjustment variables included.

Candidate and Final Risk-adjustment Variables: Candidate variables were patient-level risk-adjustors that are expected to be predictive of readmission, based on empirical analysis, prior literature, and clinical judgment, including demographic factors (age, sex) and indicators of comorbidity and disease severity. For each patient, covariates were obtained from Medicare claims extending 12 months prior to and including the index admission. The model adjusted for case differences based on the clinical status of the patient at the time of admission. We used condition categories (CCs), which are clinically meaningful groupings of more than 15,000 International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes. We did not risk-adjust for CCs that were possible adverse events of care and that were only recorded in the index admission. In addition, only comorbidities that conveyed information about the patient at that time or in the 12-months prior, and not complications that arose during the course of the hospitalization were included in the risk-adjustment.

The final set of risk-adjustment variables included:

Demographic	Age-65 (years above 65, continuous) Male
Comorbidity	Diabetes mellitus (DM) and DM complications Iron deficiency and other/unspecified anemias and blood disease Congestive heart failure Valvular and rheumatic heart disease Chronic obstructive pulmonary disease (COPD) End-stage renal disease or dialysis

	Other urinary tract disorders Arrhythmias Pneumonia Renal failure Vascular or circulatory disease Disorders of fluid/electrolyte/acid-base Coronary atherosclerosis/other chronic ischemic heart disease History of infection Cerebrovascular disease Metastatic cancer and acute leukemia Cancer Decubitus ulcer or chronic skin ulcer Dementia and senility Angina pectoris/old myocardial infarction Stroke Asthma Acute coronary syndrome Hemiplegia, paraplegia, paralysis, functional disability Protein-calorie malnutrition Anterior myocardial infarction Other location of myocardial infarction History of coronary artery bypass grafting (CABG) surgery History of percutaneous transluminal coronary angioplasty (PTCA)
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Full details of the development of the risk-standardization model for this measure are available at [www.qualitynet.org](http://www.qualitynet.org) .

## Standard of Comparison

External comparison at a point in time

External comparison of time trends

Internal time comparison

## Evaluation of Measure Properties

### Extent of Measure Testing

To evaluate the performance of the model used for 2010 public reporting, we fit the condition-specific risk standardized readmission model to three single-year datasets (2006, 2007, and 2008) and to the combined three-year 2006-2008 calendar year dataset. We re-estimated the model variable coefficients and examined the model performance in each of these datasets. We also examined trends in the frequency of patient risk factors.

Specifically, we:

- Assessed model hierarchical generalized linear model (HGLM) performance in terms of discriminant and predictive ability and overall fit for each of the single-year datasets (2006, 2007, and 2008) and for the combined 2006-2008 calendar year dataset.

- Fitted HGLMs for the same datasets and compared both fixed-effect estimates and hospital-level covariance estimates across the different time periods.

We additionally assessed the performance of the measure using preliminary public reporting data for admissions with discharges between July 1, 2006, and June 30, 2009. The results were substantively similar to those for the 2006-2008 calendar year dataset (data not shown).

We computed a summary statistic for assessing model performance: the area under the receiver operating characteristic (ROC) curve (c-statistic), which is an indicator of the model's discriminant ability

or ability to correctly classify those who are and are not readmitted within 30 days (values range from 0.5 meaning no better than chance to 1.0 meaning perfect discrimination). The area under the ROC curve (c-statistic) remained constant at 0.63. For the model using the 2006-2008 calendar year dataset, the observed readmission rate was 8.3% among patients in the lowest predicted decile and 33.3% among patients in the highest predicted decile, a range of 25%.

Examining the overall distribution of the risk-standardized readmission rate (RSRR) based on the 2006-2008 calendar year dataset, the 25th and 75th percentiles were 19.4% and 20.3%, respectively. The odds of all-cause readmission if treated at a hospital one standard deviation above the national average was 1.34 times higher than the odds of all-cause readmission if treated at a hospital one standard deviation below the national average. If there were no systematic differences between hospitals, the between-hospital variance would be zero and the odds ratio would be 1.0.

## Evidence for Reliability/Validity Testing

Bernheim SM, Lin Z, Bhat KR, Savage SV, Wang Y, Grady JN, Desai MM, Wang Y, Wang C, Gao J, Normand SL, Drye EE, Krumholz HM. 2010 measures maintenance technical report: acute myocardial infarction, heart failure, and pneumonia 30-day risk-standardized readmission measures. Baltimore (MD): Centers for Medicare & Medicaid Services; 2010 Mar 31. 52 p.

## Identifying Information

### Original Title

READM-30-AMI: thirty-day all-cause risk standardized readmission rate following acute myocardial infarction (AMI) hospitalization.

### Measure Collection Name

National Hospital Inpatient Quality Measures

### Measure Set Name

CMS Readmission Measures

### Submitter

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

The Joint Commission - Health Care Accreditation Organization

### Developer

Centers for Medicare & Medicaid Services/The Joint Commission - None

Yale-New Haven Health Services Corporation/Center for Outcomes Research and Evaluation under contract to Centers for Medicare & Medicaid Services - Academic Affiliated Research Institute

### Funding Source(s)

## Composition of the Group that Developed the Measure

This measure was developed by a team of clinical and statistical experts from Yale University/Yale-New Haven Hospital Center for Outcomes Research and Evaluation (Yale-CORE) and Harvard University, through a Centers for Medicare & Medicaid Services (CMS) contract with the Colorado Foundation for Medicare Care (CFMC).

## Financial Disclosures/Other Potential Conflicts of Interest

Unspecified

## Endorser

National Quality Forum - None

## Included in

Hospital Compare

Hospital Quality Alliance

## Adaptation

Measure was not adapted from another source.

## Release Date

2009 Oct

## Revision Date

2010 Apr

## Measure Status

This is the current release of the measure.

This measure updates a previous version: Specifications manual for national hospital inpatient quality measures, version 3.0b. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; 2009 Oct. various p.

## Source(s)

Specifications manual for national hospital inpatient quality measures, version 3.1a. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; 2010 Apr 1. various p.

## Measure Availability

The individual measure, "READM-30-AMI: Thirty-day All-cause Risk Standardized Readmission Rate Following Acute Myocardial Infarction (AMI) Hospitalization," is published in "Specifications Manual for National Hospital Inpatient Quality Measures." This document is available from [The Joint Commission Web site](#) . Information is also available from the [QualityNet Web site](#) . Check The Joint Commission Web site and QualityNet Web site regularly for the most recent version of the specifications manual and for the applicable dates of discharge.

## NQMC Status

This NQMC summary was completed by ECRI Institute on July 13, 2009. The information was verified by the measure developer on December 29, 2009. This NQMC summary was updated by ECRI Institute on November 8, 2010. The information was verified by the measure developer on December 17, 2010.

## Copyright Statement

The Specifications Manual for National Hospital Inpatient Quality Measures [Version 3.1a, April, 2010] is the collaborative work of the Centers for Medicare & Medicaid Services and The Joint Commission. The Specifications Manual is periodically updated by the Centers for Medicare & Medicaid Services and The Joint Commission. Users of the Specifications Manual for National Hospital Quality Measures should periodically verify that the most up-to-date version is being utilized.

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